THE EFFECT OF RAINFALL AND TIME OF PLANTING ON YIELD OF TARO (*COLOCASIA ESCULENTA* (L.) Schott) IN WESTERN SAMOA

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SUMMARY

The best time for planting rainfed taro in Samoa is in the second half of the year. This is explained on the basis of correlations between yield and cumulative rainfall occurring during the months of tuber bulking. Rainfall during the period up to tuber initiation is only weakly correlated with yield. If irrigation is practised, the time of planting is less important.

RESUME

La meilleure période pour planter le taro pluvial en Samoa se situe dans la seconde moitié de l'année. Cette observation est fondée sur les corrélations existant entre le rendement et l'accumulation de la pluie pendant les mois où le tubercule se développe. L'intervention de la pluie jusqu'a la période de d'initation du tubercule n'a qu'une faible corrélation avec le rendement. Si on pratique l'irrigation, la période de planta tion a moins d'importance.

RESUMEN

La mejor época de siembra para malanga de temporal en Samoa, es en la segunda mitad del año. Esto se explica sobre la base de correlaciones entre el rendimiento y la lluvia acumulativa que ocurre durante los meses de abultamiento de tubérculo. La lluvia caída hasta la iniciación del tubérculo, correlaciona sólo débilmente con el rendimiento. Cuando se tiene riego, la época de siembra es menos importante.

INTRODUCTION

Taro is primarily adapted to moist environments, but can be grown under a wide range of agricultural circumstances ranging from paddy culture in swampy lands, upland conditions with irrigation, or as a rain fed crop[6]. In Samoa, most taro is grown as a dry land rain fed crop. As in many Pacific islands where taro forms a staple diet item, planting is carried out every month and fresh taro is available throughout the year. Reynolds[8] has shown responses to irrigation during the dry season. Little is known in detail on the influence on yield of dry spells occurring during different parts of the growth cycle. We have examined the effect of rainfall and time of planting on taro yields in Western Samoa in an attempt to gain some information on this.

MATERIALS AND METHODS

Twelve blocks of taro were planted at Alafua College on a uniform area during the period September 1969 to March 1970. A single block was planted on the 15th day of each month. A block comprised 4 plots measuring 5.5 x 4.6 m on each of which a different spacing was used (91.5 x 1.5 cm, 76 x 76 cm, 76 x 61 cm and 61 x 61 cm): The spacing trial is not analysed in this paper but yield data from the 4 plots at each harvesting date have been combined to give a mean taro yield in kilograms per plot. All the plots were harvested after a growth period of 7 months. For various reasons yield data for only 9 harvests were obtained. We have assessed the relationship between yield data and rainfall occurring at certain growth stages by correlation.

RESULTS

The rainfall pattern over the growth period for each planting date is presented in Table 1 with details of taro yields. Correlation coefficients for taro yield on rainfall for 10 different cumulative combinations of monthly rainfall are presented in Table 2. It is apparent that r values are highest for sets of rainfall occurring in periods of a few months leading up to the second half of the seventh month of growth, hence, this is the critical period for yield depression by drought. Eighty three percent of variation in taro yield is accounted for by rainfall in months 4,5 and 6 ($r = 0.91^{***}$).

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DISCUSSION

Previous attempts at predicting taro yields[5,6,7] have focused attention on foliar parameters. Where leaf area values at 5, 7 and 10 months have been used results have been unsatisfactory in that relationships between leaf parameters and corm weight have been generally low – at most only 33% of variation in corm weight has been able to be explained, and then only after much laborious measurement. However, in Hawaii, leaf area at 3 months[5] was closely related to corm yield (r = 0.83). While leaf growth studies are continued, it is suggested that a supplementary method of assessing *relative* yields, and relating these to rainfall, in a *given area* is to use our method.

Clearly the amount of rainfall in the second half of the growth period is far more important than that in the first 3 months. Wright[10] described the climate of Samoa in terms of 7 environmental classes. Our results indicate that the best time, of those we have tried, for planting taro in Samoa is in September, October or November, but data were not available for June, July and August plantings which we might anticipate could show higher yields than from plantings in the first part of the year. Taro planted in the second half of the year produced yields up to 150 percent higher than that planted from January to May.

Our results can be explained in the light of the growth stage studies of Campbell *et al*[1,2] and Chapman[3] on White Lisbon Yam (*Dioscorea alata* L.), and Ching[4] on taro (*Colocasia esculenta*). These authors have identified three stages of growth for taro (and yam).

1. One to four/five months – essentially a period of rapid development of root and shoot with corm/tuber initiation only.
2. Four/five to six months – a climax of root and shoot growth together with maximum rate of corm/tuber development.
3. Six to nine/eleven months – senescence and decay of root and shoot with reduced rate of corm/tuber enlargement, leading to maximum size in the eighth/eleventh month.

It is clear from a separate study[9] that Samoan taro, often pulled after seven to nine months, follows similar growth stages. The rainfall requirement in months, follows similar growth stages. The rainfall requirement in months 4, 5 and 6 of the seven month growing period enables maximum corm development to take place.

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TABLE 1

Rainfall (cm) and taro yield

Planting date	15.9.69	15.10.69	15.11.69	15.12.69	15.1.70	16.2.70	16.3.70	15.4.70	15.5.70
Harvesting date	13.4.70	15. 5.70	15. 6.70	15. 7.70	14.8.70	15.9.70	15.10.70	16.11.70	17.12.70
Month*									
1	9.02	16.46	43.92	40.28	33.25	43.21	57.84	20.72	23.52
2	16.46	43.92	40.28	33.25	43.92	62.26	20.73	23.52	12.34
3	43.92	40.28	33.25	43.92	62.26	20.73	23.52	12.34	4.62
4	40.28	33.25	43.92	62.26	20.73	23.52	12.34	4.62	11.84
5	33.25	43.92	62.26	20.73	23.52	12.34	4.62	11.84	23.55
6	43.92	62.26	20.73	23.52	12.34	4.62	11.84	23.55	29.59
7	60.99	20.73	23.65	12.34	4.62	12.19	23.55	29.59	93.27
Cumulative rainfall over growth period	247.84	260.82	268.01	236.30	200.64	159.07	154.44	126.19	198.73
Taro yield (kg/plot)	30.39	25.20	27.62	21.61	12.15	13.62	12.03	16.45	17.05

* Each month taken from 15th to 14th (inclusive) of following month except in last month when taken to harvesting date.

TABLE 2

Relationships between rainfall and taro yield

	Months	r value
1.	1,2	-0.41
2.	1,2,3	-0.20
3.	1,2,3,4	0.14
4.	4,5	0.83**
5.	6,7	0.50
6.	4,5,6,7	0.87**
7.	5,6	0.86**
8.	5,6,7	0.72
9.	4,5,6	0.9.***
10.	All	0.80**

* P > 0.05

** P > 0.01

*** P > 0.001